

BioFurrow

BioFurrow™

The DBS is instrumental in establishing the BioFurrow™. The DBS improves aeration and soil water holding capacity, reduces water erosion and increases soil organic carbon and biological activity in the root zone, all of which promote plant growth. As the DBS seeder passes through the soil, three slots are formed. (Figure 1)

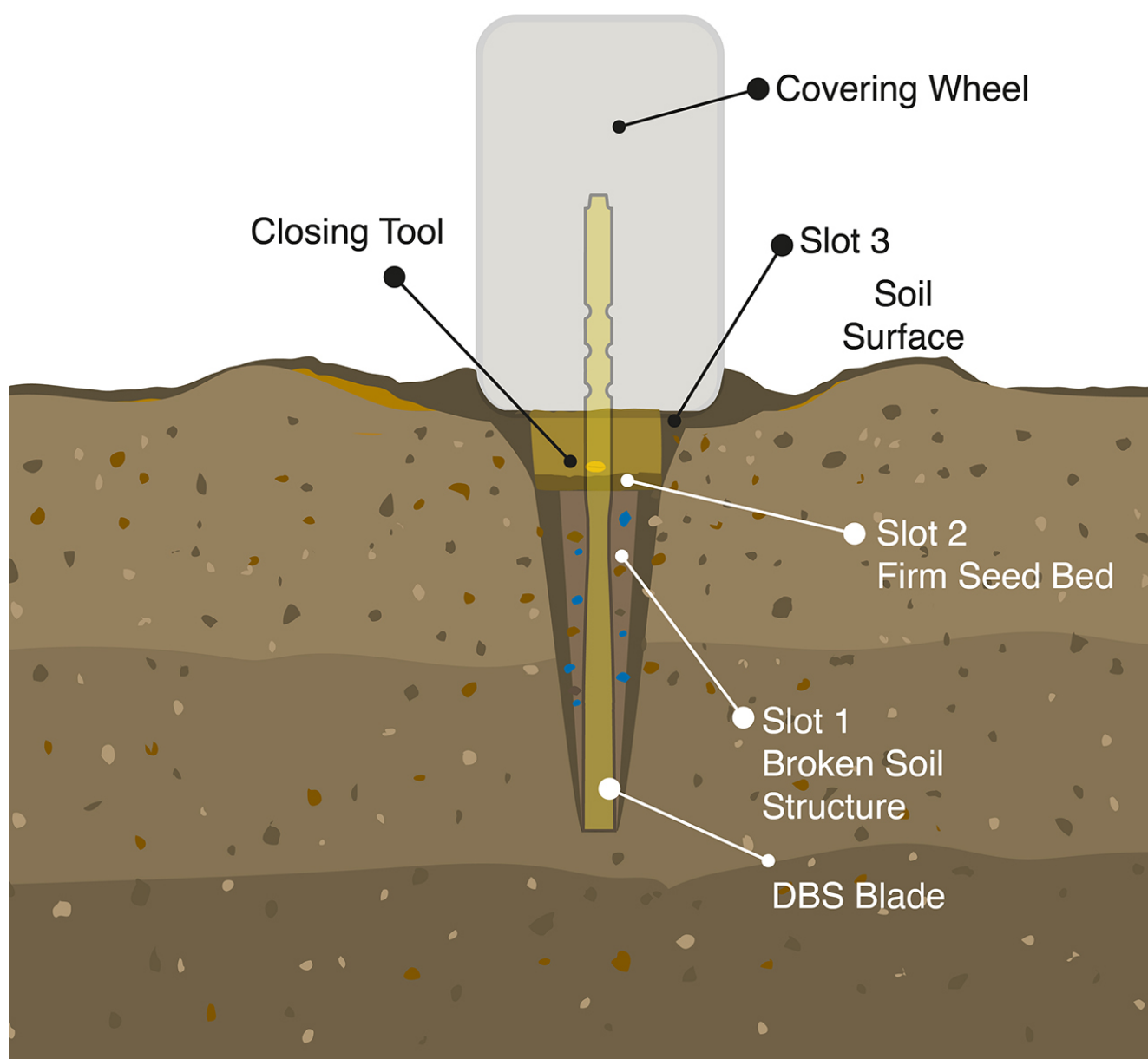


Figure 1 – The DBS establishes the BioFurrow™ consisting of three vertically aligned slots. Vertical cultivation by the DBS blade breaks up the sub-soil structure and forms the root bed (Slot 1). The closing tool forms a firm seed bed (Slot 2) above Slot 1. The covering wheel closes the seed chamber and forms a furrow (Slot 3) that assists in water harvesting.

Slot 1 is formed by a bursting action by the DBS blade that breaks up the sub-soil, creating a root bed with multiple pathways for air and water entry; this creates an environment for healthy root growth and microbial activity that supports plant growth. Liquid fertilisers can be delivered into this space for plant uptake as new roots develop. This feature is

unique to the DBS with the blade angle designed for optimum depth of sub-soil cultivation. **Slot 2** is formed by the closing tool which creates a firm seed bed on which the seed rests, immediately above **Slot 1**. The covering wheel closes the top of the seed chamber causing soil fines to cover the seed, while forming a water-harvesting furrow above (**Slot 3**). Water harvested in **Slot 3** and water vapour rising from sub-soil water via **Slot 1** increase the Relative Humidity around the seed and this is the primary source of water for seed germination. Scientific research has shown that Relative Humidity in the soil remains at 100% provided soil water contents are above wilting point. These three slots form the BioFurrow™, a moist, aerated and nutrient-rich environment where soil microbial communities flourish and plants thrive. Soil microorganisms are broadly defined as microscopic life forms that include bacteria, archaea, viruses, fungi, protozoa, nematodes and other microscopic creatures that are critical for plant health and nutrition. Healthy soils typically contain between 1-2 tonnes/hectare of microbial biomass (more than 10 billion microbes/kilogram of soil) and many kilometres of fungal hyphae (thread-like structures). Approximately 70% of microbes occur in the top 10 cm of the soil profile in the root zone. Soil microorganisms are essential for transforming nutrients, including organic matter and minerals, into forms that plants can use, and provide beneficial products such as enzymes and vitamins and other products needed for healthy plant growth. Fungal hyphae behave like an extended root system capturing and supplying nutrients to plants from some distance away from plant roots. However, soil microbes need food for growth and activity. This is supplied from plant roots in a mutually beneficial exchange. Plant roots deliver beneficial products from microorganisms, and minerals and water from the soil to the rest of the plant. The above-ground parts of the plant take up carbon dioxide through photosynthesis to make carbohydrates (complex sugars) in their leaves. These complex sugars are

transported to the rest of the plant providing energy for growth, and in turn, feed (via root exudates) soil microorganisms associated with the roots (for a more comprehensive description of the role and importance of carbon in plant growth and microbial functions in soil, ([More Information](#))). A classic visual of this root zone, called the rhizosphere, is the 'dreadlock' appearance of healthy roots, to which moist soil and microorganisms adhere (Figure 2).



Figure 2 – The root zone (called the rhizosphere) of healthy plants typically has a 'dreadlock' appearance due to the adherence of moist soil and microorganisms. It is a region of intense biological activity.

This mutually beneficial arrangement between plants and microbial communities associated with the roots, that results in a proliferation of numbers and diversity of microorganisms in the root zone and enhanced plant growth, constitutes the BioFurrow™ ([Download PDF](#)). Development of a fully functioning BioFurrow™ takes time and builds throughout the growing season of a crop. Therefore, it is desirable to retain this biologically active BioFurrow™ in subsequent cropping seasons. [Near-Row \(On-Row\) Sowing](#) into the previous season's BioFurrow™ is a way of achieving this and extending the

benefits to following crops.

Additional Source Material on the BioFurrow



[BioFurrow](#)
[\(Download PDF\)](#)



[Ausfacts – Volume 27 Issue](#)
[1 March 2022](#)
[\(Download PDF\)](#)

Carbon is Cycled Through Plants and Soil Microorganisms Delivering Energy for Biological Processes.

(Margaret M Roper)

Carbon is the basic building block of all living creatures. It is the basis of all organic compounds and without carbon there would be no life.

In terms of energy, carbon is well known as an energy source in non-living systems (e.g. oil and coal, which when burnt deliver energy).

In living creatures carbon delivers energy through the metabolism of sugars which are also carbohydrates (consisting of carbon, hydrogen and oxygen). Almost all living organisms use sugars (in one form or another) for energy where sugars are metabolised to carbon dioxide and water with an associated energy output.

During photosynthesis plants take up carbon dioxide from air and convert it into glucose (which is the simplest sugar/carbohydrate). Within the plant, glucose is converted into more complex carbohydrates including cellulose which forms much of the structural components of plants, but some glucose and other simple sugars are transported to the roots. Here the glucose may be utilised to grow the roots, but some will leak out into the soil around the roots and feed soil microorganisms which also need carbohydrates/sugars to grow and produce enzymes and other beneficial compounds needed by the plant.

Once a plant dies, the carbohydrate components of the plant including cellulose and simpler carbohydrates are broken down by soil organisms to provide energy for other microbial processes in the soil. Eventually the carbohydrates will be used up and given off as carbon dioxide and water and the whole process starts again with another plant taking up this released carbon dioxide.

Only leaves with chlorophyll can photosynthesise carbon dioxide. Newly germinated seeds cannot and are dependent on the starch reserves (a simple carbohydrate) in the seed for energy. Once the new shoots emerge and produce green leaves, photosynthesis in the new plant can begin. (Starch consists of glucose molecules joined together and is very easily metabolised).

In a farming context, retaining crop stubbles after harvest may increase the amount of carbon available to soil microorganisms and may contribute to soil carbon reserves. Chopping the straw and spreading it on the soil surface enables more rapid decomposition carbon-rich stubbles, releasing (1) simple sugars that drive microbial processes in soils, and (2) left-over mineral nutrients for use by soil microbial communities and new plants.